Ecoflo â Treatment System
Provisional Approval and Testing Protocol
July 1, 2002

I. System description.

The Ecoflo® ST-650 and STB- 650 wastewater treatment system consists of the following listed key components. This provisional protocol is based on the specific components listed. Equivalent components may be used after receiving written approval from the Division of Onsite Sewage and Water Services. Unless otherwise stated, the components of the Ecoflo system shall comply with the intent, objectives and requirements of the Sewage Handling and Disposal Regulations.

A. Building Sewer. The building sewer used in conjunction with an Ecoflo® system shall comply with Part IV, Article 2 of the Sewage Handling and Disposal Regulations (the regulations).

B. Pretreatment system. The minimum pretreatment system preceding an Ecoflo® system shall be a septic tank designed and installed in compliance with Part IV, Article 3 of the Sewage Handling and Disposal Regulations but having a holding capacity of not less than 1,000 gallons. An EFT–080 effluent filter manufactured by Premier Tech Environment shall be installed in the septic tank.

C. Secondary treatment system. The Ecoflo® system consists of a treatment module, nominally 13’8" x 7'9" x 4'4" (L,W,D) containing a proprietary biofibrous media, capable for treating design flow of 600 GPD (i.e., up to 4 bedrooms). Systems designed for 5 and 6 bedrooms will use two (2) treatment modules. Septic tank effluent is either received directly by gravity or dosed from a pumping station to the treatment module where treatment occurs by a combination of physical, biological and chemical processes. The average treatment capability of the Ecoflo® is reported in Table 1 and, in part, formed the basis for this approval.

Parameter	Percent Reduction
BOD_5 (mg/l)	>96%
TSS (mg/l)	>95%
NH3-N (mg/l)	>90%
Tot. coliform	>99.9%
E. coli	>99.9%

Table 1

D. Conveyance system. All effluent conveyance components designed to move effluent from the Ecoflo® system to an absorption area shall comply with the requirements of 12 VAC 5-610-880 of the Sewage Handling and Disposal Regulations. [**Note:** Conveyance system refers to the actual conveyance system and not to the proprietary gravity and/or pump and pump chamber (PSA 240) portions of the Ecoflo® system.]

E. Absorption area. When the criteria found in the *Sewage Handling and Disposal Regulations* and Figure 1 are met, the absorption field shall be designed in accordance with Table 2 (of this document), for all systems covered by this policy.

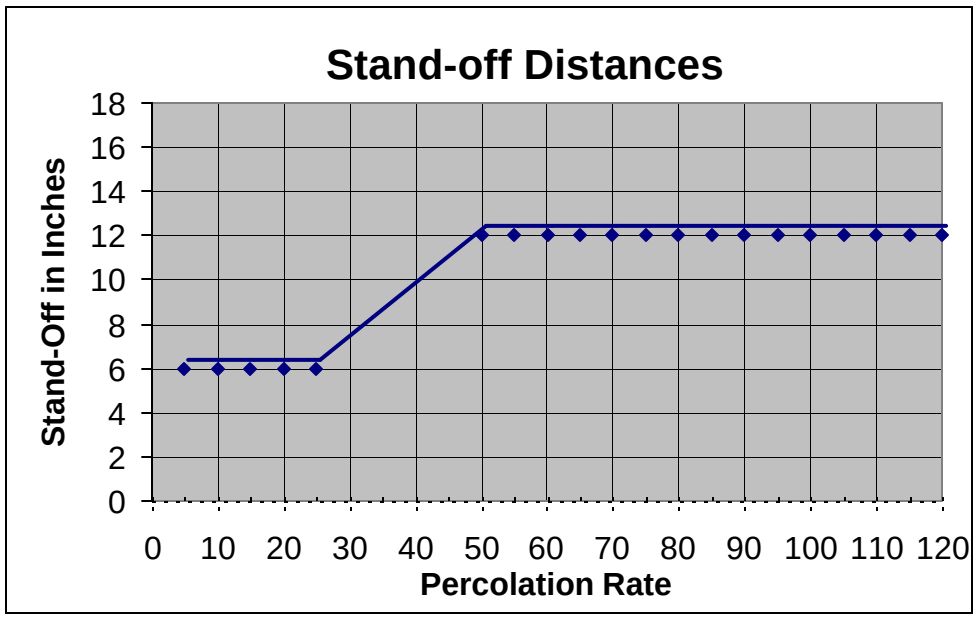

Figure 1

II. Scope of Waiver.

This Provisional Approval is granted for facilities generating residential strength wastewater that have a design flow not exceeding 1,000 gallons per day. Larger flows may be permitted but shall be reviewed individually to assure compliance with the requirements of §441 of the *Regulations*.

Approval is also granted to the Ecoflo® Biofilter as an aerobic biological system pursuant the Sewage Handling and Disposal Regulations.

III. Siting Criteria.

The Ecoflo® system may be used to provide wastewater treatment at any site that meets one of the following classifications:

1. Any site that does not comply with the minimum stand-off to rock and/or water table requirements contained in the Sewage Handling and Disposal Regulations but does comply with the requirements of Figure 1.

2. Any site that fully complies with the criteria contained in the Sewage Handling and Disposal Regulations, including but not limited to absorption area sizing percolation rate, landscape position, stand-off distances, and set-back distances. This includes sites that comply with the *Regulations*, whether or not secondary effluent is required.

3. Any repair permit that complies with 12 VAC 5-610-280 C.2, where the Ecoflo® system is used to enhance wastewater treatment and potentially enhance wastewater disposal.

IV. Design Criteria.

All portions of the system shall be designed to provide wastewater treatment and disposal that is equal or superior to that which may be obtained with a conventional gravity drainfield system.
In general, the system must provide primary treatment, advanced secondary wastewater treatment, and effluent distribution and application to soils capable of providing sufficient additional secondary treatment to render the wastewater harmless to humans and the environment. Specific deviations from the design practices contained in the Sewage Handling and Disposal Regulations are described below.

A. Field Design.

The absorption area required may be achieved by use of the bed area, use of trenches, or a combination of both bed area and trenches provided:

1. The minimum stand-off to water table, or other limiting factor, is achieved over the entire absorption area. This assures that sufficient suitable soil, as may be required, exists between the soil and the limiting factor to provide additional treatment.

2. All beds and trenches shall be installed on contour.

3. All pad areas (bed type design) shall be designed such that in all instances the

bottom pad area shall be level while maintaining separation distances to all soil limiting factors. No portion of the pad bottom area may be installed on fill material. On sites where these conditions cannot be met, another absorption area configuration shall be used.

4. The system shall be designed to provide nominally equal flow throughout all portions of the absorption area. Distribution of effluent by gravity or pressure dosing (before or after the treatment modules) is acceptable.

5. The maximum bed area per module will be 600 square feet.

B. Area Requirements and Calculations.

Ecoflo® Biofilter Systems shall be designed in accordance with Table 2 of this document. Systems may be configured where the absorption area consists of a "bed" (absorption bed) with the Ecoflo® module(s) placed above the absorption bed, or the absorption area may consist of trenches, or a combination of trenches and bed area. Low pressure or drip dispersal may be used as distribution methods also.

1. The size of the bed, if utilized, shall not have a length to width ratio in excess of 6:1. The bed may be shaped to maximize slope and site conditions. The bed area shall be placed on contour and shall not exceed 600 square feet. For the purpose of dividing flow between beds and trenches (where both are used in a single system) the following methodology is used. Flow to the bed is determined by the formula Q=Plr*A where Q equals flow to the bed in gallons, Plr equals the bed loading rate in gallons per square foot (found in Table 2) and A is the area of the bed in square feet. The remaining flow (Q) is then used with table 2 to determine the square footage necessary for the trenches .

2. Any Ecoflo® Biofilter system with a required absorption area to be in excess of 600 square feet shall utilize trenches. Trenches may be constructed to be contiguous to the gravel bed or as stand alone trenches. The area required for the additional trench area is determined using the equation above.

3. The minimum area for any Ecoflo® system is 320 square feet.

4. Conditional use permits based on limited occupancy (or other specified criteria) shall be permitted in accordance with the Sewage Handling and Disposal Regulations.

5. No additional area reductions shall be granted for the use of water saving fixtures.

6. No additional area reductions shall be granted for use of alternative drainfield materials such as chambers, styrofoam, tire chips, large diameter pipe, etc.

Hydraulic Loading Rates For Drainfields Receiving Ecoflo® ST-650 or STB-650 Treatment System Effluent				
Percolation Rate (Minutes/Inch)	Gallons Per Day Per Square Foot			
	Beds	Trenches		
		1.5 wide	2.0 wide	3.0 wide
20 OR LESS	1.66	2.78	2.50	2.22
25	1.33	2.22	2.00	1.78
30	1.11	1.85	1.66	1.48
35	0.95	1.59	1.43	1.27
40	0.83	1.39	1.25	1.11
45	0.74	1.23	1.11	0.99
50	0.67	1.11	1.00	0.89
55	0.61	1.01	0.91	0.81
60	0.55	0.93	0.83	0.74
65	0.51	0.85	0.77	0.68
70	0.48	0.80	0.72	0.64
75	0.44	0.74	0.67	0.59
80	0.42	0.69	0.63	0.56
85	0.39	0.65	0.59	0.52
90	0.37	0.62	0.56	0.49
95	0.35	0.58	0.53	0.47
100	0.33	0.56	0.50	0.44
105	0.32	0.53	0.48	0.42
110	0.30	0.51	0.45	0.40
115	0.29	0.48	0.43	0.39
120	0.28	0.46	0.42	0.37

Table 2

C. Distribution

The total required absorption area may be achieved by using one or more discrete absorption areas. When a pad (bed) absorption area is used beneath an Ecoflo® Biofilter(s) one of the following distribution methods shall be used:

1. The bottom of all portions of the absorption area shall be installed at a single elevation (+/- 2") and on contour (requires a flat or essentially flat area), or
2. All absorption trenches shall be installed on contour. If using gravity distribution on sites with slopes in excess of 10%, a collection bottom shall be placed on the Ecoflo® Biofilter(s) to feed a serial distribution field (utilizing drop boxes). When

pumping from Ecoflo Biofilter with a collection bottom parallel, serial, or pressurized distribution may be utilized at the designers discretion.

D. Depth.

The minimum installation depth of the system i.e., the bottom of the gravel bed and/or trenches that comprise the absorption area, shall be level with the naturally occurring grade. On sloping sites this shall be measured on the downhill side of the installation (i.e., no fill may be placed below the absorption area). Cover material shall be provided from the top edge of the Ecoflo units and slope to meet existing grade and shall cover the top and side of the bed area that may be exposed during construction. The minimum cover over the bed area, and any trenches, shall not be less than 4 inches. Vegetative stabilization shall be provided prior to placing the system in use. Fill material shall cover to two inches from the lip of the Ecoflo® Biofilter.

E. Slope. The maximum allowable slope shall be 50%.

F. Pump Design.

The Ecoflo® Biofilter need not use a pump if site conditions allow for a completely gravity fed system. The gravity line between the septic tank and the Ecoflo® Biofilter shall have a slope of not less than six inches per 100 feet.

When a pump is required due to site conditions, Premier Tech Environment manufactures a proprietary pump chamber to dose to or from the Ecoflo® Biofilter. The design and installation of this pump is proprietary and need not comply with the Sewage Handling and Disposal Regulations provided the following conditions are met

1. The pump, pump chamber, and appurtenances do not create any health hazards, safety problems or nuisances.
2. The average life of the pump chamber and components is not less than seven years.

V. Installation.

A. Installers shall be trained by Premier Tech Environment. or their authorized representative, and be certified as having passed their minimum training qualifications prior to installing any systems in Virginia.

B. The manufacturer's recommendations shall be followed for system startup.

C. All mechanical components, pumps, pump cycling, filters, systems must be demonstrated to be fully operational in accordance with their design.

VI. Operation.

All system owners shall be provided with written and oral instruction on the proper operation and maintenance of the Ecoflo system. Updates, revisions and other changes to this section are the responsibility of Premier Tech Environment. Copies of changes shall be submitted to the Department on an informational basis.

Nothing in this approval is intended to prevent or restrict the development of instructional materials for public use. No prior approval of such literature is required provided the literature contains no endorsements, approvals, or suggestions that the Department in any manner promotes the use of one system above any other.

VII. Testing and evaluation procedures.

A specific sampling protocol for field testing, sampling, and evaluation will be developed and conducted under the supervision of the Division, in conjunction with Premier Tech Environment. The conducting of all sampling and the submission of all reports shall be done by, or under the supervision of, a qualified individual mutually agreed upon in Virginia, to be designated jointly by the Division and Premier Tech Environment. If a local or district health department wishes to monitor a particular system for which they have issued a permit under this protocol, the manager or supervisor from that office shall contact Division staff, who will recommend to Premier Tech Environment that the system be included in the sampling program.

The responsibility for assuring that sampling occurs rests exclusively with Premier Tech Environment. Effluent samples shall be collected from at a depth of 12" below the bottom of the absorption area. For the purposes of evaluating test results, samples will be collected to assess performance at a point below an estimated 12" of unsaturated soil. [Note: As initially permitted, systems installed in soils with a percolation rate of less than 50 minutes per inch, and in accordance with this protocol, will not always be installed at least 12 inches above a seasonally saturated horizon.]

Each system selected by the Division and Premier Tech Environment for sampling shall have two suction lysimeters installed for the purpose of sampling effluent. At least one of these lysimeters shall be located beneath the footprint of the Ecoflo® Biofilter system. One lysimeter may be located beneath an absorption field trench provided it is located within the first ten feet of the trench. Because of the advantages of installing monitoring devices at the time of system installation, as compared with retrofitting of monitoring devices to systems already installed, the Division or Premier Tech Environment. may contact a local health department for assistance in the scheduling of installation of systems selected for sampling. The suction lysimeters must be designed and installed to preclude the entrance of untreated effluent and the final design

and installation process shall be agreed between VDH and Premier Tech Environment within six months of installing the first system and prior to installation of any of the lysimeters.

Standards

Fecal Coliforms : The average of samples collected from unsaturated soil horizons shall have a geometric mean of less than 10 cfu/100mls and have no single sample in excess of 200 cfu/100mls. Sample results obtained during the first six months of operation may be discarded from the performance evaluation at the sole discretion of VDH, when there appears to be due cause.

Nitrate-nitrogen: No performance standard is established; however, results may be used to demonstrate nitrate-nitrogen reduction and used where this is necessary.

Chlorides: An increase in chloride concentrations must be observed to confirm that treated effluent is being collected.

BOD5: Septic tank effluent samples must be greater than 100 and less than 300 mg/l for any individual samples and average greater than 150 mg/l over the sampling period to verify that a typical strength residential waste is being treated. BOD5 in the effluent from the treatment system shall not exceed 30 mg/l.

TSS: Total Suspended Solids in the effluent from the treatment system shall not exceed 30 mg/l.

Surfacing and ponding: Any system that shows surfacing of effluent shall be considered a failure. An evaluation shall be made of the system and the cause of failure and corrective action shall be taken. Ponding depth within the absorption area shall be monitored on a monthly basis in each system. Two monitoring ports shall be installed exclusively for this purpose and ponding depths reported not less than monthly. Ponding depths shall be compared with systems installed in conventional systems to attempt to determine the life expectancy of the system with the higher application rate of more highly treated wastewater.

VIII. Operation and monitoring.

For the first five years of use after this experimental protocol is granted, Premier Tech Environment Inc. shall maintain a log of all systems installed. Said log shall include the following minimum information: System location (by tax map or GPS coordinates) soil conditions where the system was installed, and all associated physical, biological and chemical data if the system is one being monitored. This log shall be reported to VDH on a quarterly basis and shall be provided by the 15th of the month following the end of the quarter. The log shall be available to VDH within 5 business days upon request.

IX. Responsibilities and permitting procedures.

A. This approval has been granted specifically for the process described in the application made by Premier Tech Environment for the Ecoflo® Biofilter system. Any changes to the components used in this process must be reviewed and approved by VDH on a case-by-case basis prior to use.

B. No contractor may install an Ecoflo® system unless they are first certified by Premier Tech Environment and/or an authorized Ecoflo® Distributor, as meeting their minimum competency standards for contractors.

C. The Ecoflo® Biofilter system is a provisionally approved system; however for the purposes of permitting, it shall be handled in the same manner as a Type II system.

D. Permitting shall be done by the local health department based on their satisfactory site evaluation and review of plans and specifications prepared in accordance with the manufacturer's specifications and all applicable state regulations and policies and any relevant local ordinances.

E. Construction permits (i.e., not operation permits) normally shall be valid for a period of 18 months; however, no construction permit shall be valid beyond the completion date of the provisional approval. The Virginia Department of Health shall establish the completion date of the provisional approval by determining when sampling on the 24 or more systems being monitored under this protocol will be completed. Upon successful completion of the provisional approval, the Department will convert unused construction permits to conventional construction permits and extend the life of the permit to 18 months from the date of issuance. Such conversion shall be done at no cost to the permit holder. In the event that the system fails to meet the criteria of the provisional approval, unused permits will not be renewed.

Permits shall note the provisional approval nature of the system and that they cannot be converted to an approval letter. Upon successful completion of the provisional approval protocol, the holder of a valid provisional approval permit may convert the same to either a conventional construction permit or an approval letter. In the event that the system fails to meet the provisional approval protocol, the Department is not obligated to reissue either a construction permit or a certification letter.

F. Premier Tech Environment shall be responsible for providing up to six classes (up to 50 students each) during the first 6 months after this approval is granted and two classes annually thereafter. The training shall include a manual covering proper siting, sizing, construction, installation and inspection processes for the Ecoflo® Biofilter. All training materials, the course syllabus and training locations shall be reviewed and approved by the Division prior to training occurring.

G. Should the Ecoflo® Biofilter systems fail to perform to the satisfaction of the Department, the Department may rescind or modify this provisional approval protocol. Prior to taking such action the Department shall notify Premier Tech Environment in writing of the nature of the problem and of the action the Department intends to take.